

large white patch on the back of the lower part of the neck, and a still larger white saddle on the loins, through which ran a dark dorsal streak to the tail. The under-parts were scarcely lighter than the back; and the legs had no white, being cigar-brown in front and golden brown behind. The horns were of great size, and remarkable for their extreme depth. In the absence of white on the legs and the dark under-parts, the skin was like that of *C. sibirica sacin*, but the latter had no white nuchal patch and a very indistinct lumbar saddle. The associated female skin, in which the hair on the back was just changing, so that the grey *pashm*, or under-fur, was exposed, was remarkable for the circumstance that the whole of the under-parts were pure white, quite unlike what the describer had seen in any other Ibex.

Mr. Lydekker believed that Mr. Walter Rothschild had an Ibex skin similar to the male exhibited which would be shortly described as a new form.

The following papers were read:—

1. On the Marine Fauna of Christmas Island (Indian Ocean). By C. W. ANDREWS, B.Sc., F.Z.S., EDGAR A. SMITH, H. M. BERNARD, R. KIRKPATRICK, and F. C. CHAPMAN.

[Received January 16, 1900.]

(Plates XII. & XIII.)

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I. *Introductory Note.*

The chief objects of my recent visit to Christmas Island (Indian Ocean) were to collect the land fauna and flora and work out the structure of the island itself, and nearly the whole of my time was devoted to these ends. At the same time some small collections of the marine fauna were made, and these have been determined by various specialists, some of whose reports are printed below. The Gephyrean worms (six species, none of which are new) have already been noticed by Mr. A. E. Shipley in the Proceedings of this Society (P. Z. S. 1899, p. 54).

The shores of Christmas Island are singularly unfavourable for the collection of marine animals ; except in a very few localities, the coast-line is formed by vertical or overhanging cliffs, the base of which is washed by the heavy ocean swell, so that the narrow shelf of fringing reef, which is submerged to a depth varying from a few feet to several fathoms, is unapproachable from the land side, and, except along the north coast in very calm weather, is very difficult of access from a boat. Nevertheless, the examination of this reef and of the submarine slopes of the island between N.E. and N.W. Points, and the collection of their fauna, where possible, would no doubt yield very interesting results, and it might be worth the while of a marine zoologist to spend some time on the island for this purpose.

In a few localities on the east coast and at Flying Fish Cove, a narrow reef-flat, like that of an atoll, is exposed at low water, and it is from this in the latter locality that nearly all the specimens mentioned below were obtained. In this place an area about a quarter of a mile long and from fifty to a hundred yards wide is exposed at low tide. Its outer edge forms a slightly raised rim of rocks thickly coated with pink and red calcareous algæ, and is cleft here and there by deep narrow channels. Within this raised rim the reef-flat forms a hard concrete-like floor composed of cemented fragments of corals, larger blocks of which lie loose upon its surface. Here and there are shallow pools of water, some of which are choked with thick clumps of small branching Madreporæ (e. g., *M. clathrata*, *M. valida*, *M. aspera*), the tops of which are exposed to the air for a considerable time between the tides. In some of these pools also there are extensive patches of a pinkish-grey, leathery Alcyonarian (*Sarcophyton*). Most of the Corals obtained were from these pools or from the sides of the deeper channels near the edge of the reef. The reef is interrupted near the middle of the bay by a boat-channel with a sandy bottom running up to the beach, and it was from sand taken from about 11 fathoms in this channel that the Foraminifera described by Mr. F. C. Chapman were obtained.

The reef-flat seems on the whole rather barren of life. The swiftly running shore-crabs (*Grapsus maculatus*), which skim over the rocks like leaves driven by the wind, and two Holothurians, the smaller quite black, the larger olive-brown, are the most conspicuous objects. In the pools are numerous small fish, including a little *Periophthalmus* which jumps from stone to stone with great activity.

The Crustaceans and Echinoderms determined by Mr. R. I. Pocock and Prof. Jeffrey Bell are :—

Crustaceans :—*Actæa nodulosa*, *Eriphia levimanus*, *Actæodes tomentosus*, *Lophozozymus* sp., *Daira perlata*, *Chlorodius* sp., *Calcinus elegans*, *C. tibicen*, *Aniculus typicus*, *Stenopus hispidus*, *Pencæus* sp. ; there is also a large cray-fish which is used for food, but of which unfortunately no specimen was brought back.

Echinoderms :—*Linckia miliaris*, *L. diplax*, *Nardoa tuberculata*,

Ophidiaster sp., *Ophiocoma aethiops*, *O. scolopendrina*, *Actinopyga miliaris*, *Diadema saxatile*, *Echinometra lucunter*, *Colobocentropus atratus*. Of the Echinoids, *Echinometra* is the commonest and lives in holes in the rock, which it appears to excavate.

Towards the extreme edge of the reef many small specimens of *Tridacna gigas* nearly embedded in the rock may be seen, but they never attain very great size here. Squids and a species of Octopus are fairly common, but very difficult to discern; the Octopus is often used for food by the people, while the Squids are devoured in large numbers by the Gannets and Frigate-birds.

The reef-fish were not collected; they, however, are much the same as those found at Cocos-Keeling Islands, and probably are all common Indo-Pacific forms. They form an important part of the food of the people, and are usually obtained with the spear, in the use of which the Cocos-Islanders are extraordinarily skilful.

Below will be found lists and descriptions of the Molluscs, Corals, Sponges, and Foraminifera; and I must express my sincere thanks to the Authors of these communications for the trouble they have taken over the small collections I was able to bring back.

II. *A List of the Marine Mollusca collected by Mr. C. W. Andrews at Christmas Island.* By EDGAR A. SMITH.

No pretence of systematically collecting marine objects was made by Mr. Andrews, his direct object having been the investigation of the geology and the terrestrial fauna and flora. A certain number of specimens, however, observed during rambles upon the coast, were captured and preserved. Those mentioned in the following list were found in Flying Fish Cove on the north coast of the island. They are mostly very common forms, having a wide range in the Indian and Pacific Oceans.

1. OCTOPUS sp.
2. OMMATOSTREPES sp.
3. CONUS HEBRÆUS Linn.
4. CONUS CORONATUS Dillwyn.
5. LEUCOZONIA SMARAGDULA (Lamk.).
6. TRITONIDEA UNDOSA (Linn.).
7. ENGINA MENDICARIA (Lamk.).
8. IOPAS SERTUM (Bruguière).
9. SISTRUM MORUS (Lamk.).
10. SISTRUM RICINUS (Linn.)

11. MITRA (STRIGATELLA) LITERATA Lamk.

12. MITRA (STRIGATELLA) PAUPERCULA, var.

A short form like *M. virgata* Reeve (Conch. Icon. fig. 197 *b*), with the spire transversely grooved and the white stripes upon the body-whorl somewhat raised, forming feeble costulations.

13. CYPRÆA ARABICA Linn.

Both typical specimens and the variety *reticulata*.

14. CYPRÆA VITELLUS Linn.

15. CYPRÆA LYNX Linn.

16. CYPRÆA MONETA Linn.

17. CYPRÆA ANNULUS Linn.

18. NEBITA COSTATA Chemnitz.

19. TURBO LAJONKAIIRII Deshayes.

Hitherto known only from Cocos-Keeling Islands, the original locality "New Zealand" not having been confirmed. Two very brightly coloured specimens, copiously blotched and spotted with purple-brown. The operculum has the central portion olive-green, instead of "dark brown" as described and figured by Pilsbry (Man. Conch. vol. x. p. 199, pl. lix. fig. 10).

20. SMARAGDINELLA VIRIDIS Rang.

21. PHYLLIDIA VARICOSA Lamk.

22. DORIS CORIACEA Abraham.

23. PERONIA PERONII Cuvier.

24. TRIDACNA GIGAS Linn.

Only a single very young specimen.

25. SEPTIFER BILOCULARIS (Linn.).

26. ARCA IMBRICATA Bruguière.

27. MELINA PERNA (Linn.).

Very variable in form, but always showing the characteristic colour-markings. Specimens in the Museum are from Cocos-Keeling Islands, Andaman and Samoa Islands.

Perna samoensis, Baird (Brenchley's Cruise H.M.S. 'Curaçoa,' p. 454, pl. xlii. fig. 8), is a synonym of this species (*vide* Hanley's *Ipsa Linnæi* Conch. p. 117, pl. ii. fig. 7).

specimens, in which the septa appear to run distinct to the columella, under the older generic name.

The specimens are both low groups of calicles rapidly budding, and in one case dying away beneath the living cluster, but in the other rising on a pedestal 2-3 cm. high, and on one side bare of polyps.

Occurs in rock-pools under the cliff on the south side of Flying Fish Cove.

Genus MADREPORA.

MADREPORA (ISOPORA) BROOKI, sp. n.

Corallum with typical growth, viz., a thick common base from which 3 or 4 stout flattened branches radiate outwards, with an upward curve. The tip of each branch expanding and branching again. [The branches are 3-4 cm. thick and 4-6 wide, but as the coral is continually thickening these measurements are of no classificatory importance.]

Certain of the calicles on the tops of the branches or of knobs are thin and cylindrical, and may be as much as 4-5 mm. long by 2.5 in diameter, and among these are others of all lengths but with one side cut down; the larger are nearly complete, the shorter are purely scoop-shaped. Here and there these incomplete calicles appear grouped irregularly round a complete calicle. The whole of the rest of the stock, except on the undersides of the branches (which are warty and nearly bare of calicles), is thickly covered with scoop-shaped calicles of all sizes and turned all ways, the majority looking upward; many are mere punctures on the surface with a slightly raised margin, others have one edge protuberant like a lip; from this all stages are found up to the long scoop-shaped calicle. The calicles show no special feature, their costal ridges are regular, smooth, and not prominent; the whole wall in the larger calicles rapidly solidifies. The interstitial cœnenchyma fills up as systems of floors supported on long spines like that typical of *Astræopora*. The smaller calicles are lighter and more openly reticular.

There is one large complete specimen, two fragments from other stocks, and a branch worn smooth, yet recognizable by the section which shows the peculiar interstitial cœnenchyma. The species differs not only in growth-form, but in size and characters of the larger tubular calicles, from all the members of the subgenus described by Mr. G. Brook in the British Museum Catalogue of Madreporaria, vol. i.

The large specimen was brought up from 11 fathoms by the sounding-lead in Flying Fish Cove. Much of the shore cement seems to be made up of rolled fragments of this madrepora.

MADREPORA (?) CLATHRATA Brook.

Madrepora clathrata Brook, Brit. Mus. Madr. i. p. 49, pls. v. & vi.

There are several fragments, one a long branching stalk (13 cm.

long), from what I take to have been a prostrate, or other one-sided growth-form. The branchlets are all turned up one side and grow out at right angles, and the scoop-shaped radial calicles project on the same side also at right angles and are chiefly obsolete on the opposite side. The branches show no trace of fusing together. In other respects, however, it comes nearest to *Madrepora clathrata*. The calicles, both radial and axial, seem to agree in shape and size, and the characters of the cœnenchyma seem to be the same as those described for this species.

The specimens of this and the next species were broken from dense clumps growing on the reef-flat in water about one foot deep at low tide, when the tops of the clumps are exposed for some time.

MADREPORA VALIDA.

Madrepora valula Dana, Zoophytes, p. 461, pl. 35. fig. 1.

There is a complete specimen consisting of a crowd of processes all reaching to about the same height (\pm cm.), and rising from a common incrusting base, which seems to come near Dana's type. The tips of most of the processes in the single specimen had been injured, and the coral had attempted to heal the injuries. The axial calicles and a few of the nearer radial calicles are swollen into cœnenchymal knobs, without or with greatly reduced or distorted calicle apertures. Where not injured, the calicles have much the aspect described and figured by Dana, and the section of the processes shows the density of the coral, also mentioned by Dana.

MADREPORA (?) ASPERA Dana.

Madrepora aspera Dana, Zoophytes, p. 468, pl. 38. fig. 1.

A specimen 8 cm. high, in which the tapering branches more or less suddenly proliferate into a number of stunted outgrowths. The septa in the radial calicles show it to belong to the subgenus *Eumadrepora* Brook. The size of its axial corallite, the variously prominent and labellate radial calicles interspersed with minute obsolete calicles, seem to ally it with *M. aspera*. It differs chiefly in the greater crowding of the radial calicles, which were comparatively sparse in the type specimen.

This species forms dense clumps growing on the reef-flat, and partly exposed at low-water.

MADREPORA DELICATULA Brook.

Madrepora delicatula Brook, Ann. & Mag. Nat. Hist. viii. 1891, p. 461.

There are two small detached clusters of twigs which agree with the branchlets of Brook's type of *M. delicatula*. The measurements and shapes of the calicles both axial and radial agree, as also do the markings on the surface as described.

There is no evidence that the growth-form resembled that of

Brook's type. Hence the identification is provisional. Some variation in this respect exists between the specimens which Brook classed under this heading (see Brit. Mus. Madr. vol. i. pl. xxviii. figs. D & E).

Found in pools and channels near the edge of the reef-flat, Flying Fish Cove.

Genus MONTIPORA Quoy & Gaimard.

MONTIPORA SPONGILLA, sp. n.

Description. The corallum forms an erect spike about 5 cm. long and from 1-1.5 thick, which flattens near the top and divides into 2 to 3 or more similar spikes running up, side by side, or diverging at very small angles. The calicles are minute, 0.5 mm., but deep and conspicuous, about 1 mm. apart. The margin, usually formed by a single skeletal thread, is round or slightly petaloid. The septa not very well developed, except the directives, one of which is usually specially conspicuous as a broad plate which may or may not be slightly exsert.

The smooth surface-cœnenchyma is a light friable reticulum, very rough to the touch; the tips of the branches are open flake-reticulum and friable; the coral is very light.

This Montipore is peculiar, not only in its method of growth, but also in its lightness and friability. There is one complete stock.

Occurs in pools on the reef-flat, Flying Fish Cove.

MONTIPORA PARASITICA, sp. n.

Description. Corallum as a closely incrusting plate on other corals, 5 mm. thick, no free edges, but with a narrow smooth zone running round the margin of the stock, 2-3 mm. broad; within this zone the whole surface is covered by tubercles. These are strikingly variable and are in all sizes, from minute branching or frosted granules to rounded or cylindrical tubercles, coarsely woolly, nearly 1 mm. high, here and there fusing into short ridges, and scattered about in small patches.

The calicles are very irregularly distributed, and vary in size from .5-.75 mm.; often obscured by the rough uneven tubercular surface. The section is dense, built up of stout trabeculæ, and wherever the surface tubercles are rubbed off, the solid stony texture beneath is seen.

The single specimen is nearly complete and incrusts the base of the type specimen of *Madrepora brooki*. Among known Tuberculate Montipores this seems to stand alone in manner of growth, and in the very variable distribution and development of the tubercles. I believe many more small incrusting tuberculate forms of *Montipora* will be discovered (*cf. M. inconspicua*). They can be easily overlooked, and only attract attention when studied under a pocket-lens.

11 fathoms. Flying Fish Cove.

Genus PORITES Lamarck.

There is one small, thin, triangular chip from a stock of *Porites*. The method of growth is unknown. The lower sectional surface shows a regular, rather dense reticulum in which the radiate skeletons of the calicles can still be faintly traced. The calicles are small (1 mm.), polygonal, shallow, but sharply sunk. The walls are either thin, straight, or zig-zag threads, septa appearing irregularly along the margin, or else below it as distinct plates. The pali are stout frosted rods.

This fragment is too small to classify. It comes nearest in the character of its calicles to a group of *Porites* in the National Collection from Ramesvaram, Gulf of Manaar, which I have already described in the MS. of vol. iv. of the 'Catalogue of Madreporaria' as *Porites indica*. Until more is known of its growth and variations it may therefore be provisionally placed with that group.

On the reef-flat, Flying Fish Cove.

Genus (?) GONIOPORA Quoy & Gaimard.

In the same bottle with the spirit-specimen, provisionally identified with *Goniastrea retiformis* (see below), is a small crumpled incrusting coral with edges slightly free, which has all the appearance of a Goniopora. The specimen is complete and almost too small to allow (without spoiling) of the detachment of portions for close examination of the skeleton, which is now hidden under the retracted soft parts. The budding round the edge is quite different from that of *Goniastrea*, and the top edges of the walls which show in rough outline through the skin are not at all like those of that genus, whereas in both these respects the specimen shows more resemblance to *Goniopora* than to any other stony coral with which I am acquainted.

Explanate Goniopores are by no means common, so that even without closer identification the specimen is of interest.

In pools and channels on the reef-flat, Flying Fish Cove.

Genus POCILLOPORA Lamarck.

There are three specimens which seem to belong to two species; both form low tufts—in one case of crisp irregular branches, and in the other of thick flattened lobes. The species in this genus are mainly founded on differences of growth-form, and longer series would probably unite many of them. In the present case there appears also to be some difference in the calicles which justify their separation.

POCILLOPORA (?) BREVICORNIS Dana.

Pocillopora (?) *brevicornis* Dana, Zoophytes, p. 526, pl. 49. fig. 8.

A small tuft, the branchlets below are rounded off, above are angular; the round calicles have a distinct ring of septal striæ.

POCILLOPORA (?) FAVOSA.

Pocillopora (?) favosa Ehrenberg, Corallenthiere, p. 127.

Two small tufts of short, stout, compressed lobes, thickly covered with small conical, or rather pointed processes; no septa visible except as striæ in the very young calicles. These two specimens are placed under this specific heading with some hesitation. In M.-Edwards's description of *P. favosa* a distinct columella is mentioned, but no septa. Mr. Stanley Gardiner¹ describes septa—"the primaries being specially thick and bluntly spined;" and Dr. Klunzinger², who photographed the original type, says that there is little columella, and the septa are hardly at all developed. In these last points the two specimens from Christmas Island agree with Ehrenberg's type, but hardly with its more freely branching growth.

Occurs in pools and channels on the reef-flat, Flying Fish Cove.

Genus GONIASTRÆA M.-E. & H.

GONIASTRÆA RETIFORMIS.

Goniastrea retiformis (Lamarck) M.-E. & H. Les Coralliaires, ii. p. 446.

Two fragments of a convex small-calicled species of *Goniastrea* which may be provisionally placed with this species. The size of the calicles (3 mm.) agrees, but their depth is greater, at least on the summit of the stock, where it may reach 5 mm.; elsewhere it is 3 mm., as given by Milne-Edwards & Haime.

No locality is given for Lamarck's type.

There is further a spirit-specimen in a good state of preservation, which shows the living colony to have been of a bright green colour. The dried skeletons with attached organic matter are reddish brown.

Found in pools and channels on the reef-flat, Flying Fish Cove.

GONIASTRÆA AURICULARIS, sp. n.

Description. Colony forms ear-shaped, semicircular plates which project horizontally from the sides of rocks. Its upper surface is slightly concave, the edge thin and sharp, supported by continuous epitheca which covers the whole under surface. The thicker parts are about 1.5 cm.

The calicles, owing to the method of multiplication, vary greatly in size, the maximum being about 3.5 mm. The top of the thin wall is a fine zigzag; some 16-18 visible septa rise to the top of the wall and may even make the edge slightly denticulate; between these, faint traces of another cycle can be seen with a pocket-lens. The swollen inner edges of the primaries (at times of a few secondaries also) rise as thick, flattened, round-topped pali to within about 1 mm. of the top of the wall.

¹ Proc. Zool. Soc. 1897, p. 941.

² Corallenthiere, iii. 1879, p. 68, pl. vii. fig. 2.

In its explanate growth this is not unlike *G. planulata* of Milne-Edwards & Haime, from some unknown locality, but the calicles in that species are 7-8 mm. across, sometimes lengthening to 15 mm. before dividing. This is the second explanate species of *Goniastrea* which has been recorded, although it may be remarked by the way that the diagnosis of the genus is not so clear as might be, and it is not always easy to distinguish between *Goniastrea* and *Prionastrea* (cf. Klunzinger, *op. cit.* vol. iii. 1879).

In pools and channels in reef-flat, Flying Fish Cove.

Genus (?) CAULASTRÆA.

A few very varying fragments in spirit which appear to come between *Mussa* and *Caulastræa*. There is a single flabellate corallite (4.5 cm. long by 3.5 broad) which has died down, and from its fossa 3 new ones of different lengths and sizes have budded out. In addition there are two long (6 cm.) tapering corallites, with points free but fused near their rims, below which a bunch of (9) small buds project, curving upwards; below the bunch there are places where single buds have been broken off. There are two of these detached young corallites, which are very like single corallites of *Galaxea*, smooth below, ribbed above, and slightly curved. The variations among these small fragments are thus so great, that more material is necessary before any accurate account of the coral can be given, or its position in the system determined.

Genus GALAXEA Oken.

GALAXEA ASPERA Quelch.

Galaxea aspera Quelch, Chall. Rep. xvi. (1886) p. 72, pl. 4. figs. 5-5 d.

There is a dried specimen with a single loose corallite and a much finer specimen in good preservation in spirit. The latter shows the budding of the corallites above the level of the perithecal tissue. The specimens seem to agree in all ascertainable particulars with Mr. Quelch's species, viz., in their long projecting corallites, the septal formula, the pronounced costæ, and the dense perithecal tissue. As far as I have been able to ascertain, the locality nearest to the Keeling-Cocos group from which *Galaxea* has been recorded is the Straits of Sunda; but the specimen from that locality was referred by Milne-Edwards and Haime (see *Galaxea ellisi*, Les Cor. ii. p. 228) to the coral figured by Ellis (Phil. Trans. liii. 1764, pl. 20), which is quite different to this.

Pools in reef-flat, Flying-Fish Cove.

Genus MUSSA Oken.

MUSSA (?) REGALIS Dana.

Mussa (?) regalis Dana, Zoophytes, 1848, p. 182, pl. 8. fig. 5.

Two fragments of a meandrine *Mussa*. The fragments are chips from the ridges between adjoining calicles. In the smaller

dry specimen the adjoining calicles, or rather troughs, are closely adherent; the exsert septa almost overlap in the larger spirit-specimen (6 cm. long), in which the skeleton is obscured by the soft parts; the ridge between the calicles appears to widen here and there into an ambulacrum from 1–2 mm. wide. The calicular trough must have been 3 cm. deep and as much across, while the primary septa are very stout and exsert, and with their inner edges rather more vertical than in *Mussa regalis*, at least near the top of the ridge. The soft parts are bright green. Small cup-shaped galls are found on the septa here and there, somewhat like those occurring on the specimen of *Cœloria* (see below).

Occurs on the sides of the deep channels at the rim of the reef.

Genus LEPTORIA M.-E. & H.

LEPTORIA PHRYGIA Ellis.

Leptoria phrygia Ellis, Zooph. p. 162, 1786, pl. 48.

One fragment from a massive growth. It shows both straight and gyrating calicular troughs. A good section shows the thick plate-like columella with its lobed and also finely serrated edge.

The species is said to extend over the Indo-Pacific area. Dana records it from Ceylon.

Pools on reef-flat, Flying Fish Cove.

Genus CÆLORIA M.-E. & H.

CÆLORIA SINENSIS M.-E. & H.

Cœloria sinensis M.-E. & H. Les Cor. ii. 1857, p. 416.

One large specimen which agrees in all important points with this species. The Chinese type had calicular troughs not exceeding 2 cm. The specimen from Christmas Island has the same tendency to short troughs, some being round and only a few mm. in diameter, but a few reach to 3 and 4 cm. in length. What appear to be galls occur on the septa here and there.

Pools on reef-flat, Flying Fish Cove.

Genus PRIONASTRÆA M.-E. & H.

PRIONASTRÆA AUSTRALENSIS M.-E. & H.

Prionastræa australensis M.-E. & H. Les Cor. ii. 1857, p. 520.

There is a narrow convex strip with the angular surface characteristic of this genus. It may provisionally be placed near *P. australensis*, with which it agrees in size of calicle, thin walls, and rudimentary columella; while round the columella a ring, often incomplete, of larger septal teeth rises up, either 2–3 on each septum, or else one large paliform tooth.

There is further a very similar specimen in spirit of the same bright green which seems common to these Christmas Island Madreporaria. It appears to have much thicker walls than the dried specimen, but the presence of the soft parts would at least partly account for this. Slightly thicker skeletal walls it may

easily have, as some variation in their thickness is observable in the dried specimens.

Pools on reef-flat, Flying Fish Cove.

Genus AGARICIA Lamarck.

There is a fragment of what appears to be a flat incrusting disc with sharp free edges, the epitheca following about 1 cm. behind. The very young calicles are confluent in concentric rows but soon separate off, the smooth low rounded walls, finely striated by the septa, rapidly forming an irregular network over the surface; the calicles all look upwards, and are not tilted to look towards the growing edge. There are 4 cycles of septa—and if any columella, only in the deep calicles in the thicker parts of the stock. The section is very dense, the septa being thick and closely packed with traces of synapticular junctions.

Rock-pools under cliffs S. of Flying Fish Cove.

IV. *On the Sponges of Christmas Island.* By R. KIRKPATRICK.

The Sponges collected by Mr. Andrews were obtained from an area limited to the reefs of Flying Fish Cove. The majority of the specimens were found growing on the under surface of large coral blocks lying in pools left by the tide. The use of the dredge was impossible owing to the irregular rocky nature of the bottom.

Hitherto only one species (*Pachychalina spinosissima* Dendy, P. Z. S. 1887, p. 524) has been obtained from this locality. The present collection of 53 specimens, referable to 24 genera and 32 species, contains examples of 7 new species and 2 new varieties.

The Calcarea and Monoceratina are each only represented by two small specimens.

The Carnosa are represented by three species, the occurrence of *Chondrosia plebeja* Schmidt, recorded for the first time from the Indo-Pacific, being specially interesting.

The sponge-fauna of Christmas Island, so far as known at present, is very similar to that of Java.

A list of species, arranged according to the classification of Topsent, is given below.

Sub-Class CALCAREA.

1. *Clathrina primordialis* (Haeckel).
2. *Leucandra* sp.

Sub-Class DESMOSPONGIDA.

Order CARNOSA.

3. *Chondrosia reniformis* Nardo.
4. *Chondrosia plebeja* O. Schmidt.
5. *Chondrilla nuda* Lendenfeld.

Order TETRACTINELLIDA.

6. *Sidonops pieteti* Topsent.
7. *Ecionema bacilliferum* (Carter).
8. *Stelletta simplicifurca* (Sollas).
9. *Tetilla bacca* (Selenka).
10. *Tetilla ternutensis* Kieschnick.

Order MONAXONIDA.

Suborder HADROMERINA.

Section *Clavulida*.

11. *Spirastrella curvosa* Topsent.
12. *Spirastrella decumbens* Ridley, var. *robusta*, var. nov.
13. *Pseudosuberites andrewsi*, sp. n.

Section *Aciculida*.

14. *Tethya ingalli* Bowerbank.
15. *Tethya seychellensis* (E. P. Wright).
16. *Tethya affinis*, sp. n.

Suborder HALICHONDRINA.

Family AXINELLIDÆ.

17. *Hymeniacion conulosum* (Topsent).

Family PÆCILOSCLERIDÆ.

18. *Microciona dubia*, sp. n.
19. *Iotrochota baculifera* Ridley, var. *tumescens*, var. nov.
20. *Esperella pellucida* Ridley.
21. *Desmacella* sp.
22. *Stylotella irregularis*, sp. n.
23. *Stylotella*, sp.

Family HAPLOSCLERIDÆ.

24. *Rhizochalina pellucida* Ridley.
25. *Rhizochalina sessilis*, sp. n.
26. *Gellius varius* (Bowerbank).
27. *Reniera innominata*, sp. n.
28. *Petrosia exigua*, sp. n.
29. *Halichondria solida* Ridley & Dendy.
30. *Halichondria solida*, var. *rugosa* Ridley & Dendy.

Order MONOCERATINA.

31. *Spongia* (*Euspongia* auct.) sp.
32. *Spongelia* sp.

CLATHRINA PRIMORDIALIS (Haeckel).

1872. *Ascetta primordialis* var. *protogenes* Haeckel (6. ii. p. 16, Atlas, pl. ii. fig. 13).

1892. *Clathrina primordialis* Lendenfeld (8. p. 195).

The specimen consists of a small mass about 10 mm. in area by 5 mm. in height. No oscules are visible, but this is probably due to the contracted state of the sponge.

The spicules, which are equiangular and equiradial, are very small and slender, being smaller than in the typical Mediterranean form, and much smaller than in the Australian form named *Clathrina primordialis* var. *protogenes* by Carter (3. p. 510) and *C. protogenes* by Dendy (5. p. 58). The rays, which are $70\ \mu$ by $6\ \mu$, taper gradually to a rather sharp point.

LEUCANDRA sp.

The specimen forms a small oval mass 3×2 mm. plugging up an oscule of *Tetilla ternatensis*. The outer surface bristles with the projecting ends of stout oxeotes which pass through the dense mass of tri-radiates; gastral quadri-radiates can here and there be made out in spaces in the interior.

Spicules. Oxeotes $1500 \times 70\ \mu$; tri-radiates, rays sharp-pointed, often wavy, $245 \times 8\ \mu$; quadri-radiates, tangential rays curved inwards towards the apical ray; tangential ray $105 \times 18\ \mu$, apical ray $35\ \mu$ in length.

Canal-system: pores lead into incurrent spaces surrounding groups of large oval ciliated chambers $85\ \mu$ in diameter, and groups of the latter open into excurrent spaces.

The species is probably new; but since the specimen is very small and has been damaged in extraction, owing to its being partly involved in the tissues of the *Tetilla*, no specific name has been given.

CHONDROSIA RENIFORMIS Nardo.

One typical specimen occurs; it is bluish black on the upper surface; pale brown below, where it is attached by a narrow ridge to the rock. The one rather large oscule has a membranous slightly serrated margin. The colour on section is dirty white. I have examined some fragments of the type specimen of *Chondrosia ramsayi* Lendenfeld, and agree with Topsent in regarding this species as a synonym of *C. reniformis*.

A noticeable feature in the Australian specimen is the abundance of pigment in the interior, giving the sponge a slaty colour on section.

Distribution. Mediterranean; Kattegat; Tadjurra, Gulf of Aden; Port Jackson; Amboina; Christmas Island; Galapagos Islands.

CHONDROSIA PLEBEJA O. Schmidt.

1868. *Chondrosia plebeja* O. Schmidt (14. p. 1).

There are eight specimens, seven in alcohol and one in formol; PROC. ZOOL. SOC.—1900, No. IX.

their shape is subspherical, elongated or pyriform, and they vary in size from 1 to 5 c.c. in length or diameter, and in colour from yellow to dark brown. The alcohol specimens are much shrunken and corrugated, the surface being marked with polygonal or elongated depressions ("wabige vertiefungen," O. Schmidt) with pigmented stellate markings. The specimen in formol, which was unfortunately transferred to alcohol, was bluish-black and quite smooth.

On drying, the surface has a distinctly gritty appearance, caused by the shrinking of the dermal membrane on the foreign particles beneath.

The foreign bodies (fine sand-grains, sponge-spicules) form a fairly-well defined layer in the cortex and just beneath the dermal membrane; in one specimen spicules projected beyond the surface at right angles. There are no foreign bodies scattered in the interior of the body, differing in this respect from the specimens from Algiers described by O. Schmidt.

Distribution. Mediterranean; Atlantic; Christmas Island.

CHONDRILLA NUDA Lendenfeld.

1867. *Chondrilla nuda* Lendenfeld (9. p. 105, pl. x. figs. 69-71).

One small specimen of this species occurs in the form of a rounded bilobed mass $8 \times 9 \times 4$ mm. in size, growing on *Chondrosia plebeja*.

The surface is bluish-black and smooth, and shows under a lens a faint whitish reticulate pattern. The larger lobe has two minute raised oscules $\cdot 3$ mm. in diameter. The cortical layer includes columns of large granular pigmented cells, as in the specimen from Zanzibar.

The spicules are slightly larger than in Lendenfeld's specimens. The oxyasters, 30μ in diameter, possess 8 sharp spines usually slightly curved. The spherasters, 25μ in diameter, possess 25-30 sharp-pointed pyramidal prickles. In the Zanzibar specimens the oxyasters are $22-30 \mu$, and the spherasters only $10-12 \mu$ in diameter.

Distribution. Zanzibar; Christmas Island.

SIDONOPS PICTETI Topsent.

1897. *Sydonops picteti* Topsent (18. p. 431, pl. xviii. fig. 2).

1898. *Sidonops picteti* Lindgren (10. p. 349, pl. xviii. fig. 17, pl. xx. fig. 6).

There are four small specimens, the largest of which is 5 c.c. by 2 c.c. in area and 1.5 c.c. in thickness. Several small spherical buds about 2 mm. in diameter are lightly but closely attached by bundles of oxeote spicules. When a bud is detached, a shallow circular depression remains, the sterrastral crust here being thin and biconcave in section.

The slender cortical oxeas and the oscular palisade of spicules described by Lindgren are present.

Distribution. Amboina; Java; Christmas Island.

ECIONEMA BACILLIFERUM (Carter).

1887. *Stelletta bacillifera* Carter (4. p. 78, pl. vi. figs. 9-14).

1897. *Ancorina simplex* Lendenfeld (9. p. 96, pl. ix. figs. 12-34).

1898. *Ecionema bacilliferum* Lindgren (10. p. 335, pl. xvii. fig. 17; pl. xix. fig. 27).

1899. *Ecionema bacilliferum*? Lindgren (10 A. p. 88).

The largest of the four specimens in this collection is 4×5 c.c. in area and 1 c.c. in thickness, and forms a thick crust; in colour pale brown mottled with dark brown.

The type specimen from Mergui, being in the Calcutta Museum, is not available for comparison. The prototriænes are very rare in the Christmas Island specimens. The microstrongyles, which are $18 \times 2 \mu$ in size, are occasionally centrotylote. The fine cortical oxeas measure $180 \times 4 \mu$.

The asters are tylote, and with roughened actines, the same characteristics being found in the asters of *Ancorina simplex*, of which species the Museum possesses a few slides prepared from the type specimens from Zanzibar.

Distribution. Mergui, Java, Christmas Island, Zanzibar; var. *robustum*: Port Phillip, Ports Elliot and Adelaide.

STELLETTA SIMPLICIFURCA (Sollas).

1886. *Myriastria simplicifurca* Sollas (16. p. 189).

1888. *Myriastria simplicifurca* Sollas (17. p. 114,* pl. xii. figs. 29-33).

1898. *Stelletta simplicifurca* Lindgren (10. p. 332, pl. xviii. fig. 8).

Of the three specimens of this species, one is small ($8 \times 6 \times 6$ mm.) and oval; the other two are in the form of thick nodular lamellæ, the larger being 5×3 c.c. in area and from 1 to 2 c.c. in thickness.

	Small spec. Christmas I.	Largest spec. Christmas I.	Torres Straits. 'Challenger.'	Cochin China. Lindgren.
Orthotriænes. Rhabdus ...	1375 × 50	1825 × 52	2325 × 55	2700 × 84
Orthotriænes. Cladi	280	245	366	(54),? 540
Anatriænes. Rhabdus ...	1820 × 22	1330 × 15	1860 × 29	3240 × 30
Anatriænes. Cladi	105	54	120	108
Anatriænes. Chordi	122	72	127	168
Anatriænes. Sagitta	88	48	90	84
Large oxea	1925 × 49	1330 × 24	2000 × 31	2900 × 60
Small oxea	102 × 6	210 × 3	252 × 3	252 × 4
Chiasters	12	12	12	12

The surface of the lamellæ presents a tessellated pattern, the

pores being in the grooves between the lamellæ; the pattern is not present on the thick rounded edges nor on the nodular excrescences. Several small oscules 1×0.5 mm. are present.

The specimens described by Sollas and Lindgren are probably in an early stage of growth.

There are considerable variations in the dimensions of the spicules, as will be seen from the table (p. 131) giving the sizes in microns.

Distribution. China Sea; Torres Straits; Christmas Island.

TETILLA BACCA (Selenka).

1867. *Stelletta bacca* Selenka (15. p. 569, pl. xxxv. figs. 14-15).

1883. *Tethya merguiensis*, Carter (2. p. 366, pl. xv. figs. 6-8).

1898. *Tetilla bacca* Lindgren (10. p. 328).

There are two specimens, the larger being 2.5 c.c. \times 3.5 c.c. They are subspherical, but with a concave area below apparently resulting from radial fission. The larger specimen has 20 oval depressed pore-areas and 2 oscules, all being about 4×5 mm. in area and 2.5 mm. in depth. The oscules are cloacas, in the floor of which several openings of excurrent canals are seen; the floor of the pore-areas is covered with membrane perforated by groups of pores. A section of the sponge, which is soft and cuts easily, shows bundles of spicules radiating from a central nucleus.

The spiculation is almost identical with that of a specimen from Java described by Lindgren. The length of the oxea is 3.5 mm., of the anatriænes 5.5 mm. and of the protriænes 5.2 mm.

Distribution. Samoa; Torres Straits; Amboina; Java; Mergui; Christmas Island.

TETILLA TERNATENSIS Kieschnick.

1896. *Tetilla ternatensis* Kieschnick (7. p. 527).

1898. *Tetilla ternatensis* Lindgren (10. p. 329, pl. xvii. fig. 14, pl. xix. fig. 25).

The one specimen is subspherical, $2 \times 2 \times 3$ c.c. in size; the sponge is deeply fissured in several places. There are several oscules, the largest being 3 mm. in diameter and possessing a raised rim. As in Lindgren's specimen, the surface of the sponge is crowded with Diatoms.

The very rare protriænes are irregular, one of the arms being much longer than the other two, which may be reduced to mere knobs.

This species resembles *T. dactyloidea* Carter in certain respects, the radiating bundles of the latter being formed of oxea ($1360 \times 6\mu$) midway in size between the large oxea and microxea of *T. ternatensis*.

TETHYA INGALLI Bowerbank.

1872. *Tethya ingalli* Bowerbank (1. p. 119, pl. v. figs. 11-17).

The single specimen is free, oval, 22 mm. in length, and 16 mm

in breadth and height. The surface is level, but shows a faintly marked tessellated pattern. The cortex is 2 mm. thick, and is uniformly and densely crowded with spherasters.

The spicule-measurements are given along with those of the type specimen from Fremantle for comparison.

	Strongyloxea.	Spherasters.	Choanosomal oxyasters.	Chiasters.
Christmas Island	1360 × 24 μ	70 μ	18-24 μ	12 μ
Fremantle	1470 × 35 μ	70 μ	36 μ	12 μ

Tethya ingalli shows a considerable range of variation, but, I think, would include the Christmas Island specimen in spite of its oval form and the smaller size of its spicules.

Distribution. Seychelles; Australia; Christmas Island; Java; Amboina.

TETHYA SEYCHELLENSIS (E. P. Wright).

1881. *Alema seychellensis* E. P. Wright (19. p. 13, pl. i.)

1888. *Tethya seychellensis* Sollas (17. p. 427, pl. xlv. figs. 1-6).

There are five small, free, nearly spherical specimens, all of which are gemmiferous. The outer two-thirds of the cortex is occupied by a zone of subcortical cavities.

Spicules. Megascleres—strongyloxea, 1200 × 18 μ.

Microscleres—spherasters, 48 μ. Somal chiasters, 12 μ. Choanosomal asters, 30 μ, with well-defined centrum; actines roughened, bifurcate.

The "regular hexaster" type of the oxyasters is a characteristic of this species, distinguishing it from *T. ingalli* Bowerbank.

A comparative table of spicule-measurements (in microns) of specimens from various localities is given below.

	Type from Seychelles.	Samboangan. 'Challenger.'	Torres Straits. 'Challenger.'	Christmas Island.
Strongyloxea	1750 × 30	1910 × 23	1680 × 26	1200 × 18
Spherasters	70	95	64	48
Somal chiasters	12	12	12	12
Choanosomal asters	54	60	60	30

Distribution. Seychelles; Philippine Islands; Torres Straits; Christmas Island.

TETHYA AFFINIS, sp. n. (Plate XII. fig. 1; Plate XIII. figs. 3a-d.)

Sponge incrusting, and of irregularly conical shape; upper surface rough but level, with an obscure polygonal pattern formed by depressed conules with fimbriated edges, and with two small membranous oscular cones, the apertures being 1 × 5 mm. in area.

Cortex 1.22 mm. in thickness, with a few narrow intercortical cavities arranged vertically in the outer two-thirds, the cortical spherasters occasionally occupying the whole thickness but usually

only the inner third, where they are divided into two zones by a shallow space.

Spicules. Megascleres—strongyloxea, $1330 \times 35 \mu$.

Microscleres—spherasters, 60μ . Somal chiasters, $15-18 \mu$. Dermal chiasters, 12μ .

The unique specimen measures 2.5×2 c.c. in horizontal and 2.5 c.c. in vertical plane. The rough convex under surface appears to have been torn off from a rock.

The name given to the species denotes its close affinity to *T. japonica* Sollas; it differs from the latter (1) in its mode of growth, *T. japonica* being spherical and free, (2) in having the membranous oscular cones, and (3) in the slight difference in size between the dermal and somal chiasters.

SPIRASTRELLA CARNOSA Topsent.

1897. *Spirastrella carnosa* Topsent (18. p. 441).

The specimen is cauliflower-shaped, expanding upwards from a narrow base to a height of 2 c.c., the area of the upper surface being 2.5×1.5 c.c. The upper surface is covered with low rounded papillæ.

The tylostyles, $525 \times 18 \mu$, usually have a trilobate head. The spirasters are extremely rare and very fine, being $18 \times 1 \mu$, with minute spines, and usually with four curves.

The specimen differs from the type from Amboina in having larger megascleres, these being only 330×6 to 8μ in the latter.

In Topsent's specimens, too, the surface is ridged ("froncé").

Distribution. Amboina; Christmas Island.

SPIRASTRELLA DECUMBENS Ridley, var. ROBUSTA, var. nov.

1887. *Spirastrella decumbens* var., Ridley and Dendy (13. p. 229, pl. xlv. fig. 12).

1898. *Spirastrella semilunaris* Lindgren (10. p. 323, pl. xix. fig. 23).

There are two specimens of this variety—one (1) forming a thin yellow crust on a shell, the other (2) in the form of small fleshy lobes growing on *Sidonops picteti*. Specimen (1) has a shallow patent oscule 1.5 mm. in diameter; the surface shows a delicate reticulate pattern formed by the pore-areas, the pores being circular and 40μ in diameter; sieve-like groups of 5 to 10 pores lead into subdermal spaces.

A cavernous cortex from $.5$ to 1 mm. in thickness occurs in the type specimens of the species from Torres Straits, described by Ridley (11. p. 470, pl. xliii. fig. c). The same structure is also present in the specimens from Amboina and Christmas Island. In all these specimens the minute semilunar spirasters (12μ in length) form the outermost dermal layer. Hence I have no doubt that Lindgren's species is a synonym: at the same time it is right to add that that author is in no way to blame, owing to the incomplete description of the type specimens, which are badly preserved.

The differences between the type specimen from Torres Straits on the one hand, and the specimens from Amboina, Java, and Christmas Island on the other, are constant, and render it necessary to regard the latter specimens as belonging to a well marked variety. In the type the tylostyles are longer and narrower, and the largest spirasters are smaller than in the new variety which I have named "*robusta*."

	Type.	Var. <i>robusta</i> .
Tylostyles	507 × 8 μ	432 × 12 μ
„ head	12 μ	12 μ
„ neck	6 μ	10 μ
Spirasters, smallest	8-12 μ	8-12 μ
„ largest	36 μ	48 μ

Distribution of *S. decumbens*: Torres Straits; of *S. decumbens* var. *robusta*: Philippines, Java, Christmas Island, Red Sea.

PSEUDOSUBERITES ANDREWSI, sp. n. (Plate XII, figs. 2 a-b; Plate XIII, fig. 7.)

Sponge loosely incrusting or forming free thick lamellæ. Pale yellow in colour; surface smooth, and with canalicular markings beneath the dermis; soft in consistence and easily torn. Oscules, when present, small, circular (.75 mm. in diameter), guarded by a silvery fringe or conule of tylote spicules with points centripetal.

Skeleton composed of primary lines of multispicular fibres radiating to the surface and giving off at various angles a few scattered single spicules.

Dermal skeleton very distinct and formed of tangentially arranged bundles of spicules joining to form a reticulum with tri- or quadrangular meshes.

Spicules. Tyloles 350 × 6 μ, slightly curved in the basal third; head rounded, 7.5 μ in diameter, slightly knobbed at the summit or swollen laterally.

Of the three specimens, one is incrusting and with oscules, the others are free and without oscules; the former is 5.5 × 3 c.c. in area, and .5 c.c. in thickness; the latter are considerably thicker.

The genus at present includes, as stated by Topsent, two other species, *P. hyalina* (Ridley & Dendy) and *P. sulphureus* (Bowerbank). One of the small fragments of the type specimen of *P. hyalina* has an oscule with the palisade of spicules arranged as in the new species, but the tyloles are much larger in the former, measuring 1100 × 25 μ.

HYMENIACIDON CONULOSUM (Topsent).

1897. *Stylotella conulosa* Topsent (18. p. 466).

1898. *Hymeniacion conulosum* Lindgren (10. p. 313, pl. xvii. fig. 13; pl. xix. fig. 19).

The single specimen is pyramidal, 3 c.c. in height, and with an incrusting base 3 × 1.5 c.c.

The surface is partly even, and partly provided with small hispid tufts.

The skeleton is composed of main lines of multispicular fibre radiating from base to surface, with an irregular reticulum between formed by bundles of one or a few spicules given off from the main lines; the axial columns alone are present in the tufts.

The styles, which measure $525 \times 12 \mu$, are curved near the basal end.

The nearly related species *Stylotella polymastia* Lendenfeld, referred to by Topsent *l. c.* p. 466, is synonymous with *Hymeniacidon fenestratum* (Ridley).

The proper position for the above species appears to be in the Axinellidæ. The skeleton is composed of axial lines of monactinal spicules, the reticulation being of secondary importance and absent from the tufts; some of the spicules show a double curve, characteristic of certain typical Axinellid sponges.

Distribution. Amboina; Java; Christmas Island.

MICROCIONA DUBIA, sp. n. (Plate XII. figs. 3, 3a; Plate XIII. figs. 2 a-f.)

Sponge forming an almost free or loosely incrusting lamina with margins curled up, with foreign particles adherent to the under surface where the latter is free.

Colour yellow; upper surface smooth. Skeleton formed partly of columns, each composed of one stout subtylote spicule, and partly of plumose columns of more slender tylotes opening out from base to surface, where they almost form a distinct dermal layer; numerous short spined styli arranged vertically with bases on the basal layer of the sponge. Spongin absent.

Spicules. Megascleres—stout, slightly curved subtylotes $324 \times 7.5 \mu$, head 7.7μ , slightly spined, occasionally faceted.

Slender straight tylotes $318-328 \mu \times 5.5 \mu$, head 7μ with basal end spinous.

Short spined styli $48 \times 7.5 \mu$, with sharp, often curved, spines on the basal three-fourths of the length of the spicule.

Microscleres—palmate isochelæ from 3 to 12μ . Toxa large, slender, $39 \times 1 \mu$; a shorter but thicker form (numerous), $6 \times 1.5 \mu$.

The size of the specimen is $2.5 \text{ c.c.} \times 5 \text{ c.c.}$ in area, and 1 mm. in thickness. The unispiculate columns, which occur in parts of the sponge, recall the chief character of *Hymerrhaphia*. Again, the spiculation closely resembles that of certain species of *Rhaphiodophlus* (*R. filifer* Ridley & Dendy and *R. spiculosus* Dendy), but the absence of spongin excludes the new species from this genus. The specimen is probably mature, since there are several embryos near the base of the sponge.

IOTROCHOTA BACULIFERA Ridley, var. TUMESCENS, var. nov. (Plate XIII. fig. 1.)

Specimen forming an irregular flabellate and branching growth, $6 \text{ c.c.} \times 1 \text{ c.c.}$ in area and $.3 \text{ c.c.}$ in thickness.

Spicules. Styles averaging $210 \times 10 \mu$.

Strongyles $220-250 \times 1 \mu$, with from one to three fusiform

swellings along the body, one of the ends attenuated sometimes to a blunt point. Amphidiscs $18\ \mu$.

The characteristic feature of the new variety lies in the strongyles with their peculiar swellings; these may, however, be dependent on some pathological cause such as the presence of a parasite, but I was unable to find any such organism. [In several descriptions of this species the dermal diactines are described as tylotes. In the type specimen from Port Darwin the ends of the strongyles are very slightly enlarged, a feature slightly exaggerated by the artist in the figures (11. p. 435, pl. xlii. fig. *f*); but there is no trace of terminal enlargement in the spicules of specimens from the Mascarenes, Madras, and Christmas Island.]

DESMACELLA sp.

A few small broken-up pieces of a very soft dark reddish-brown incrusting sponge, with a few crater-like oscules. The skeleton forms a unispicular network, the meshes of which are triangular and quadrangular and made up of styles, oxea, and strongyles. A few long slender toxa and one or two sigmata, together with some slender raphides, are present. The skeleton is renieroid, and spongin entirely absent. The dimensions of the spicules are:—

Styles (not rare) slightly curved, $150 \times 9\ \mu$; strongyles (rare) straight, $126 \times 6\ \mu$. Oxea (very abundant), curved, $180 \times 7\ \mu$.

Microscleres—toxa $48 \times 5\ \mu$ (rare); sigmata $24\ \mu$ (very rare); raphides (rare), $108 \times 1.5\ \mu$.

This species, which appears to be new, has not been named owing to the uncertainty as to whether all the above-mentioned microscleres seen in the preparations really belong to the sponge; several kinds of obviously foreign spicules were included.

STYLOTELLA IRREGULARIS, sp. n. (Plate XII. fig. 4; Plate XIII. figs. 6 *a-d*.)

Sponge incrusting or forming free irregular lamellæ; colour pale brown; with several small circular oscules 2 to 3 mm. in diameter on the upper surface.

Skeleton forming a rectangular network, the meshes being for the most part unispiculate, but with a few slender primary lines of spiculo-fibre 2–4 spicules thick.

Spicules. Styles $186 \times 9\ \mu$, smooth, straight or slightly curved.

Oxea $204 \times 9\ \mu$, curved.

Strongyla $150 \times 10\ \mu$, straight or slightly curved.

Slender oxea $150 \times 4\ \mu$, occasionally with a central fusiform enlargement, rare and scattered in the tissues.

This species is very near *Petrosia contignata* Thiele, from ebes (*Zoologica*, Stuttgart, 1899, Heft 24, ii. p. 20), but differs mainly in possessing slender fusiform oxea; unfortunately the central swelling is not shown in Pl. XIII. fig. 6 *d*.

STYLOTELLA sp.

Specimen incrusting, 2×1 c.c. in area, and .25 to .5 c.c. in thickness; pale brown, very soft, with several oscules 1 mm. in diameter.

Skeleton consisting of slender vertical main lines, loosely joined by single spicules in horizontal plane excepting near the surface, where the main fibres are isolated.

Spicules. Styles $132 \times 4 \mu$, with a sharp bend at the centre.

Oxea $144 \times 4 \mu$, sharply curved at the centre, and gradually diminishing to sharp points.

The skeleton is like that of a *Petrosia*, but very loosely arranged.

The specimen is too fragmentary to serve as the type of a new species.

RHIZOCHALINA PELLUCIDA Ridley.

1884. *Rhizochalina pellucida* Ridley (11. p. 608, pl. liv. fig. j).

There are only three small fragments of fistules, the longest being 4 mm. in length and 1.5 mm. in diameter.

The spicules are slightly smaller than in the type specimen, being $240 \times 9 \mu$ in the former, and $260 \times 10 \mu$ in the latter, but the shape is the same.

Distribution. Providence Island, Mascarene Group; Christmas Island.

RHIZOCHALINA SESSILIS, sp. n. (Plate XII. fig. 5; Plate XIII. fig. 8.)

Sponge pyramidal or digitate, sessile, arising from an incrusting base; surface smooth; consistence firm but rather brittle; colour (in formol) white-crystalline; translucent.

Skeleton consisting of an axial or central open spiculo-fibrous network formed of broad loose strands about 10 spicules thick, surrounded by a cortical network of more slender strands at right angles to the central network, and of a dermal isodictyal network with strands 2-3 spicules thick, with unispiculate strands in the interstices.

Spicules. Oxea $372 \times 14 \mu$, curved at the centre and diminishing suddenly near the ends to sharp points. Microscleres 0.

There are several specimens and fragments, most of them being of flattened digitate form, the largest being 30 mm. in height, 8 mm. in breadth, and 3 mm. in thickness. The specimens preserved in alcohol are dark yellow at the surface, and bright yellow in the interior, the formol specimens being white.

The new species is very near *Pellina eusiphonia* Ridley (11. p. 414, pl. xli. fig. z), from Port Darwin, but differs in the shape of the sponge and in the size of the spicules. These two species come within the subfamily Phlœodyctiinae rather than within the Renierinae.

RENIERA INNOMINATA, sp. n. (Plate XII. figs. 6, 6a; Plate XIII. figs. 5a-b.)

Sponge incrusting; colour pale brown with a faint reddish tinge; texture soft and elastic.

Skeleton forming a rather regular reticulum of unispiculate fibres with triangular (mostly) and quadrangular meshes with nodes cemented with spongin.

Spicules. Strongyles $126 \times 8 \mu$, slightly curved in the middle. Oxea $108 \times 2.5 \mu$, curved at the centre; also very slender oxea of the same length and shape, probably young forms of the thicker kind.

The specimen encrusts a *Melina*-shell, and is produced at one point into a short, stout, digitate process.

There is in the British Museum Collection an unnamed specimen (registered 82.10.17.246) of this species from Marie Louise Island, Amirante Group.

The species from Providence Island described by Ridley (11. p. 607, pl. liv. fig. i) as "*Reniera* sp. allied to *crateriformis*" has spicules of the same shape, but much larger ($480 \times 28 \mu$), and the meshes of the reticulum are multispiculate.

Distribution. Amirante Isles; Christmas Island.

PETROSIA EXIGUA, sp. n. (Plate XII. fig. 7; Plate XIII. fig. 4.)

Sponge forming a hard, thick, nodulated crust. Colour pale grey; surface smooth, and in parts showing an irregular reticulate pattern formed by pore-areas.

Oscules 1 to 1.5 mm. in diameter, numerous, some level with surface, others with slightly raised margin.

Skeleton formed of slender main lines of fibres passing vertically to the surface and connected at right angles to this plane by closely packed single spicules, so as to form circular or obscurely polygonal tubes about 70 mm. in diameter, the skeletal tubes being much more apparent near the surface and very ill-defined deeper, where the skeleton becomes a dense, confused network. Special dermal skeleton absent.

Spicules. Oxea $114 \times 5.5 \mu$, curved at the centre, and diminishing to very sharp points.

The single specimen is 4×4 c.c. in area, and 1.5 c.c. in thickness.

The salient character of this species lies in the very small size of the spicules, which are less than half the size of those of *Petrosia similis* Ridley & Dendy (13. p. 9, pl. ii. fig. 10, pl. iii. figs. 3 & 4), a species closely allied to it in other respects; the spicules are considerably smaller than those of any species with oxeote spicules from this region of the Indo-Pacific.

HALICHONDRIA SOLIDA Ridley & Dendy.

1886-7. *Halichondria solida* Ridley & Dendy (12. p. 326, and 13. p. 4, pl. ii. fig. 5).

The specimen, which is white and with an even surface, differs slightly from the type in having the ends of the oxea sharp-pointed; the spicules ($770 \times 22 \mu$) are curved at the centre.

Distribution. Amboina; Tahiti; Christmas Island.

HALICHONDRIA SOLIDA var. RUGOSA Ridley & Dendy.

The specimen is dark brown and wrinkled in places, as in the type of the variety from Api. There are several oscules, from 1 to 4 mm. across, with conspicuous membranous sphincters. The

spicules are curved at the junction of the middle and outer third, the size being $770 \times 18 \mu$.

Distribution. Api, New Hebrides ; Christmas Island.

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